CLAIMS

What is claimed is:

1. A receiver for a received signal having two or more data levels, the received signal having been transmitted over a transmission channel, the receiver comprising:

(a) two or more channel estimators, at least one channel estimator for each different data level for the received signal, each channel estimator being configured to model the transmission channel to generate an estimated signal corresponding to one of the data levels; and

(b) a comparator configured to (1) receive the received signal and the estimated signal from each channel estimator and (2) select an output data level for the received signal.

2. The receiver of claim 1, wherein each channel estimator implements a 2nd order or higher model of the transmission channel.

3. The receiver of claim 2, wherein the model is an adaptive model of the transmission channel that is dynamically controlled based on an error signal generated by the comparator.

4. The receiver of claim 2, wherein each channel estimator comprises a processing path for each order term in the model of the transmission channel.

5. The receiver of claim 4, wherein at least one of the processing paths in each channel estimator comprises a multiplication node having an adaptive coefficient that is dynamically controlled based on an error signal generated by the comparator.

6. The receiver of claim 5, wherein a processing path in each channel estimator corresponding to a 1st order term of the model with a coefficient having a value of 1, wherein the 1st order term processing path is implemented without a multiplication node.

7. The receiver of claim 1, wherein the two or more channel estimators comprise one or more adaptive equalizers, each adaptive equalizer configured to receive a current data level corresponding to one of the data levels and to generate an input signal for one or more of the channel estimators.

8. The receiver of claim 7, wherein at least one adaptive equalizer is shared by two or more of the channel estimators.

9. The receiver of claim 8, wherein all of the channel estimators share a single adaptive equalizer.

10. The receiver of claim 7, wherein each adaptive equalizer is further configured to receive one or more future data levels and the receiver comprises a channel estimator for each different combination of current and future data levels.

11. The receiver of claim 7, wherein tap data for each adaptive equalizer corresponds to sliced symbols corresponding to the two or more data levels.

12. The receiver of claim 1, wherein the comparator comprises:

(a) a subtraction node for each channel estimator configured to generate a difference signal between the received signal and the corresponding estimated signal; and

(b) a compare-and-select module configured to receive the difference signals from the subtraction nodes and to select the output data level for the received signal based on a difference signal having a smallest absolute value.

13. The receiver of claim 1, wherein:

the transmission channel is an optical transmission channel; and

the two or more channel estimators and the comparator are implemented in a single integrated circuit as analog circuitry.

14. A method for processing a received signal having two or more data levels, the received signal having been transmitted over a transmission channel, the method comprising the steps of:

(a) generating at least one estimated signal for each data level based on a model of the transmission channel; and

(b) processing the received signal and the estimated signal for each data level to select an output data level for the received signal.

15. The method of claim 14, wherein step (a) comprises the step of implementing a 2^{nd} order or higher model of the transmission channel.

16. The method of claim 15, wherein the model is an adaptive model of the transmission channel that is dynamically controlled based on an error signal generated during step (b).

17. The method of claim 14, further comprising the steps of:

(c) generating a difference signal between the received signal and the corresponding estimated signal; and

(d) selecting the output data level for the received signal based on a difference signal having a smallest absolute value.

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